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Impact of Medical School Class Ranking Systems On Applicants' Ratings for Residency Positions

Laura T. Gutman, M.D., and Seymour Grufferman, M.D., Dr.P.H.

Abstract—The systems used by the medical schools for evaluation of 106 applicants for 1984–85 pediatric level 1 (PL-1) residency positions at the Duke University Medical Center were studied by the authors to determine the possible relationship between contents of the applications and the rankings of these applicants for the National Resident Matching Program (NRMP). In the 56 U.S. medical schools studied, the grading systems of 24 medical schools used three passing grades (usually A, B, C), 14 used two passing grades (usually honors and pass), six used one passing grade (pass) and seven used a mixed system or number grades. The grading systems of five schools could not be discerned. Ten schools provided the class distribution of the awarded grades, and 23 identified the relative class standing of the applicant. Twenty-seven schools disclosed the position of the applicant in the class through grade distribution data or class standing; the 29 other schools did not make such information known. Students whose schools had identified their class positions achieved higher rankings from the residency selection committee than did students from schools which did not, in spite of the fact that schools which did not disclose the student's comparative positions were categorized as being more "distinguished."

The National Resident Matching Program (NRMP) requires each participating residency training program to rank applicants to its program in order of the program's preference. During the application process, extensive efforts are made at each institution by house staff selection evaluation committees to obtain a full understanding of the strengths, weaknesses, and other characteristics of each applicant. The final ranking of applicants for the Duke University Medical Center pediatric residency program is based in part on the dean's letter, grade and transcript information, letters of recommendation, interviews, and the results of standardized tests, such as those of the National Board of Medical Examiners (NBME). The contents of these materials, which may enable the residency program to know the comparative level of achievement among applying students, vary considerably from school to school. The authors of the present paper studied the grading systems used by the schools of the applicants for the 13 pediatric level 1 (PL-1) residency positions in 1984–85 and determined whether or not each school had provided information on the relative class standing of its students. The effect of a school's

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For related editorial, see page 735.

giving and not giving information on class standing on the ranking of applicants by the residency selection committee was then examined.

Methods

There were 385 applications for the 1984–85 PL-1 positions at the Duke University Medical Center. Of these, 106, all from U.S. medical schools, were completed fully and ranked for the NRMP. Thirty-one additional applications from U.S. medical schools were completed fully but not ranked for the NRMP for a variety of reasons: 96 from U.S. medical schools were incomplete; and 152 applications were from graduates of foreign medical schools. The study reported here was based on the 106 fully completed applications submitted by graduates of 56 U.S. medical schools for the 1984–85 PL-1 positions that were ranked for the NRMP. This study was neither planned nor done until after the rank order listing to the NRMP had been submitted.

Completed applications contained a transcript, a dean's letter, two or more letters of recommendation from faculty members of the applicant's medical school, an autobiographical statement, an application form, and the results of interviews with Duke University Medical Center faculty members.

Prior to the study, the applications had been ranked by members of the Duke University pediatric residency selection committee, on which seven pediatric faculty members and two PL-1, PL-2, and PL-3 residents served. A summary of each application had been presented to the entire committee, which had assigned a numerical score to the application. The numerical scores ranged from 100 (highest) to 500 (unacceptable).

For the present study, the transcripts were categorized by the authors according to the presence of one, two, or three passing grades by which the levels of achievement of each student in each course could be designated and whether or not information concerning the proportion of the class which had received each grade in each course was provided. The transcript was also reviewed for the presence or absence of a specific code or listing by which the reader could determine (*a*) the grading system used by the school, (*b*) the identification of the meanings of the grading symbols, (*c*) whether the assigned grading symbols conformed to the code, and (*d*) the length of descriptions of the grading system.

The transcript and the dean's letter were studied for information concerning the relative position of the student within his class by specific class rank, class percentile, or class fraction.

The 56 U.S. medical schools from which the 106 applicants graduated were divided into those which provided "comparative" information concerning the student's accomplishments and those which did not. The criteria for characterizing a school as "comparative" stipulated that the school had provided at least one of the following: (*a*) a grading system with at least two passing grades plus indication of the class distribution of those grades; (*b*) information concerning class ranking by specific class rank, class percentile, or class fraction; or (*c*) a key to the summary statement of the dean's letter.

The differences in the selection committee's rankings of applicants from comparative schools and those from noncomparative schools were assessed by the authors in two ways. First, the scores given to the applicants by the committee were categorized into four strata, 100 to 149, 150 to 199, 200 to 249, and 250 or greater. The differences were evaluated in these strata by a chi-square test for linear trend (1). Since the rankings did not ap-

pear to be distributed normally, a Mann-Whitney U test was applied to test the differences between students from the two groups of schools. Since many schools had more than one applicant, a mean score for all students from each school was computed; this precluded overweighting a particular school.

The possibility that the results might be confounded by underlying differences in the academic strength of the schools in the comparative and noncomparative groups was examined. The schools were ranked according to the ratings done by Gourman (2). This system ranked all medical schools in terms of their academic strength and categorized them into "distinguished," "strong," "good", and "acceptable-plus" groups. The schools were ranked from 1 (strongest) through 124 (weakest). In the present study, the Gourman rankings for comparative schools were compared with those of noncomparative schools and analyzed by a Mann-Whitney U test.

Results

The 106 applicants from U.S. schools who were ranked for the NRMP formed the applicant pool on which this study was based. The study applicants graduated from 56 schools located in 28 states. Thirty-two schools had only one applicant, while two or more applicants were from the other 24 schools. In all but five instances, the type of information provided by the transcript was similar for all applicants from the same school. Thirty-nine of the 56 schools provided transcripts that described the grades that could be awarded and contained a transcript key that included all the grading symbols that appeared on the transcript. Ten schools provided transcripts which did not have a key and which used grading symbols whose meaning was uncertain. Seven additional schools provided a transcript key, but the key failed to include all the grading symbols which had been awarded. Of the 56 schools, the authors were in doubt about a major aspect of the grading systems used at five schools. Two schools' transcripts showed "S" and "P" grades, without defining either, in which case S could be interpreted to mean either "satisfactory" or "superior." One school's transcript had S grades, some of which were accompanied by an asterisk, the meaning of which was not defined. One school's transcript contained grades of A, B, C, and P without stating whether or not an "H" (honors) grade was included in its grading system. Finally, one school's transcript contained a key which defined P, but S grades were awarded.

In addition to these problems in interpretation of the transcripts, five schools provided transcript keys that were excessively burdensome to read. These contained detailed descriptions of grading systems of other schools (such as agriculture and nursing) that differed from those of the medical school, descriptions that were one or more pages in length, or grading systems that had changed repeatedly from one year to the next.

Of the 56 schools, 51 provided transcripts from which the grading system could be understood with reasonable certainty (Table 1). For these schools, 24 gave three passing grades (usually high honors, honors, pass; A, B, C; or 1, 2, 3), 14 gave two passing grades (usually Honors, Pass), six gave one passing grade, four gave a mix of two passing grades in some years and one passing grade in others, and three gave numerical grades (such as 78 or 98).

Twenty-seven of the 56 schools provided "comparative" information concerning the students' ranking within the

TABLE 1

The Grading Systems of 56 U.S. Medical Schools as Determined by Evaluating the Transcripts of 106 Applicants to the Duke University Medical Center Pediatric Residency Program, 1984–85

Grading System	No. of Schools		
	Distribution of Grades Given	Distribution of Grades Not Given	Total
Three passing grades*	5	19	24
Two passing grades†	4	10	14
Numerical grades	1	2	3
One passing grade	—	6	6
Mixture of one passing grade and two passing grades‡	—	4	4
Uncertain§	—	5	5
Total	10	46	56

* Usually high honors, honors, pass; A, B, C; or 1, 2, 3.
† Usually honors and pass.
‡ A mixture of two passing grades in some years and one passing grade in others.
§ Due to ambiguous information.

class. Ten schools had a grading system which included data on the proportion of students who were awarded each grade for each course for that year or as an average of several years (Table 1). An example of a particularly effective format by which grade distribution was presented by three schools is shown in Table 2.

Table 3 describes the forms of class distribution represented by these 10 schools. In six cases the class distribution of grades was provided for each course. There were three schools in which the dean's letter provided data concerning the average percent of honors grades given for the basic science courses, required clinical rotations, and electives. One school provided data concerning the percent of honors grades given as an average of the previous five years.

Specific information concerning the comparative position of the applicant within his class was provided by 23 schools. The specific class rank of the applicant (for example "13 of 118") was provided by seven schools (Table 3). The dean's letters from five additional schools provided information concerning the applicants' percentile rank in the class (for example, "top 30 percent of class"). The dean's letters from eight schools provided information concerning class standing with regard to class quartile, class third, or class half. One final method, used by four schools to convey a student's class standing, was through a key to the summary statement at the end of the dean's letter. One of these four schools stated on an attachment to the dean's letter that final categorization of the students had been distributed so that "15.3% were Outstanding, 30.5% Very good, 30.5% Good,

TABLE 2

Sample of Transcript Format by Which a Student's Grades for Each Course and Distribution of Grades for Entire Class Can Be Presented Effectively by Medical Schools

Course	Student's Grade*	Class Distribution of Grades*			
		HH	H	P	F
Anatomy	H	10%	25%	60%	5%
Medicine I	HH	15%	30%	50%	5%

* H = honors; HH = high honors; P = pass; F = fail.

TABLE 3

Format of Information on Class Position Given on Students' Applications to the Duke University Medical Center Pediatric Residency Program by 27 Medical Schools Classified as Providing 'Comparative' Data, 1984–85

Information Provided	No. of Schools
Class distribution of grades	
Each course	6
Average of honors grades for basic sciences, required clinical rotations, and electives	3
Average of honors grades for previous five years	1
Subtotal	10
Class position of student	
Rank	7
Percentile	5
Quartile	2
Third	4
Half	2
Subtotal	20
Key provided to dean's letter summary statement	4

and 23.6% Satisfactory." One of the four schools providing a key to the dean's letter summary statement also provided other data concerning class ranking and thus was included in two categories. In summary, therefore, 23 schools provided an indication of the class position of the student through class rank, class percentile, class fraction, or a key to the dean's letter summary statement.

Two or more applications, totaling 72, were received from each of 24 schools and ranked for the NRMP. For 67 of these applicants, the type of provided information concerning grading system, class rank, class fraction, and key to the summary statement of the dean's letter was identical in all applications from the same school. Four schools provided comparative information concerning one applicant and noncomparative data for at least one other applicant.

Twenty-nine schools did not provide comparative information concerning the applicant's class standing.

Table 4 shows the selection committee's mean scores of applicants who were ranked for the NRMP from each medical school classified according to whether comparative or noncomparative information had been provided. The scores for students from comparative schools were significantly higher than were those from the noncomparative schools ($p = 0.04$). Similar analysis of these data along with the 31 completed applications that were not ranked for the NRMP, was performed to determine whether the distribution among comparative and noncomparative schools of the scores of the applicants who were not ranked in the matching program were distributed similarly to those of the applicants who were ranked. The means of the scores awarded by the residency selection committee for all applicants from each school using both ranked and unranked applicants were divided into the following five strata: 100 to 149, 150 to 199, 200 to 249, 250 to 299, and 300 and over. The chi-square was 8.85 ($p = 0.06$) in testing for the statistical signifi-

TABLE 4

Means of Scores Awarded by Duke University Medical Center Selection Committee to Applicants to Pediatric Residency Program from 27 Medical Schools Classified as Providing 'Comparative' Information and 29 Schools Providing 'Noncomparative' Information, 1984–85*

Mean Scores of Applicants†	No. of Schools	
	Comparative	Noncomparative
100 to 149	9	1
150 to 199	7	12
200 to 249	8	10
250 and over	3	6
Total	27	29

* Chi-square (with three degrees of freedom) = 8.88, ($p = 0.03$); chi-square for trend (with one degree of freedom) = 4.38 ($p = 0.04$).

† Scores assigned by committee to applicants ranged from 100 (highest) to 500 (unacceptable).

cance of the differences between the comparative and noncomparative schools. Students from comparative schools received the higher scores.

The scores did not appear to be distributed normally, and so a nonparametric test, the Mann-Whitney U test, was performed. A U value of 287.5 ($p = 0.09$) was obtained for the ranking differences of applicants from comparative and noncomparative schools. Taken together, the two tests of significance indicate a statistically significant difference between the two groups of schools at a p level of about 0.05. This indicated that students whose applications contained comparative information concerning their relative class standing had been ranked for the residency significantly more favorably than were applicants from whom comparative class standing was not available.

Differences in the academic strengths of comparative and noncomparative medical schools were demonstrated by an analysis of the mean rankings of the schools from the Gourman report (2). According to that report, the mean ranking was 48.5 (stronger) for the noncomparative schools and 62.3 (weaker) for comparative schools. By a Mann-Whitney U test, the noncomparative schools had higher ranking than did comparative schools ($p = 0.09$).

Discussion

The formats by which medical schools present the accomplishments of their graduating students are highly variable. All the medical schools in the study described here provided descriptive dean's letters. The letters of recommendation were difficult to evaluate and were almost all very laudatory. The interviews were felt by the authors to be important in confirming that the student's record was an accurate representation of the student's strengths. However, many of the considerations which led to the ranking score by the residency selection committee were based upon the data in the transcript, the dean's letter with its summary statement, and any indications of class standing.

Several aspects of the study of the transcripts were thought to be particularly important. First, the variable grading systems used by the medical schools ranged from three passing grades to only one passing grade and included numerical systems. Not all schools defined the system which they used, and consequently there were instances of unclear, possibly misinterpreted, and inadequate information. Some schools provided accompanying information on the grading system other than by a key, such as in a paragraph in the dean's letter.

Second, the importance of information on the distribution of awarded grades was exemplified by a school in which a bar graph of the letter grades A through D were given for the required courses in years 1, 2, and 3. One junior-year clerkship awarded an A to 70 percent of the class, and another course awarded an A to only 18 percent, demonstrating the wide range of achievement which had been signified by an A. A grading system that provides three passing grades is often assumed to provide better information concerning the student's achievements than is a system of two passing grades. However, the authors of the present study found that students in some courses with three possible passing grades were awarded almost solely A's and B's; this led to grade distributions which were very similar to those of schools with only two passing grades. For all of these reasons, the student's achievements are most likely to be appropriately understood by residency selection committee members

when they are accompanied by grade distribution information.

A bias in ranking which favored the students for whom comparative data had been provided and which was statistically significant appeared in the study. This occurred in spite of the observation that the noncomparative schools were significantly more "distinguished" than those in the comparative category. According to the ratings of the Gourman report, schools providing comparative information were less distinguished than those providing noncomparative information. The relative disadvantage for the students graduating from comparative schools provided a conservative bias, since the selection committee would have been expected to have favored students from the more distinguished, noncomparative schools. Instead, the students from the comparative schools were the more highly ranked, and this fact further strengthens the significance of the findings reported here.

Several prior studies have considered aspects of grading systems in relation to the residency selection process. In 1978 Moss and colleagues analyzed the performance of two cohorts of surgical residents, one from pass/fail and one from graded medical schools (3). The residents who had graduated from a school which used grades received significantly better performance ratings during their surgical rotations than the residents from the pass/fail schools. The authors of that study attributed this discrepancy in performance to the impetus to achieve due to the competition with which the students from graded schools were accustomed. It is also possible that their selection committee had been able to identify them as the superior students.

Other indications that grades may predict the excellence of postgraduate performance are found in a study of graduates of Jefferson Medical College (4). That study was based upon a questionnaire sent to the directors of residency training programs of 535 graduates between 1971 and 1975 and provided a comparison of postgraduate competence and medical school achievement. The strongest correlations were found between excellent performances as a resident and grades of 85 or above as a junior medical student and performance on the NBME Part II examination. Strong grades in the senior year also correlated with residency performance. Information on honors grades in clinical clerkships has been cited by program directors as being particularly important in the selection process (5).

In the present study, the authors describe the various methods chosen by U.S. schools of medicine to convey the academic accomplishments of their students. There was a wide range of methods by which the scholastic achievements of the students were described, in many instances leading to uncertainty among members of the selection committee about the meaning of the grades which had been awarded. Some schools provided sufficient information to enable the residency selection committee to know the relative position of the applicant within the class, and students from those schools were perceived by the committee to be the better candidates for the residency positions.

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